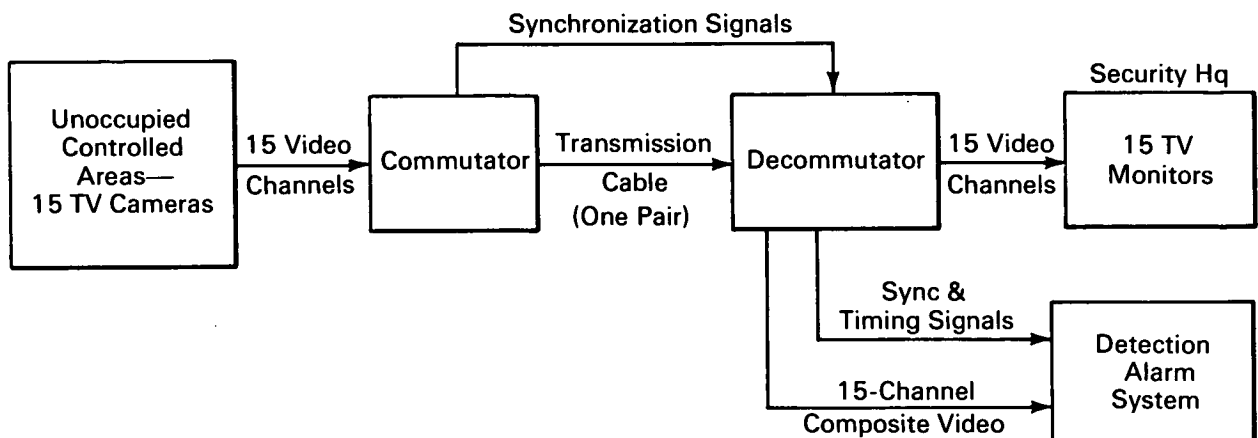


# NASA TECH BRIEF



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## Security Warning System Monitors up to Fifteen Remote Areas Simultaneously



15-CHANNEL MOTION DETECTION SYSTEM

### The problem:

To develop a security warning system that is capable of monitoring several remote or unoccupied areas simultaneously. In addition, the system must also permit visual surveillance of each area. At present, no such system is commercially available. One company has designed a prototype, but it works with only one television camera and monitor.

### The solution:

A video motion detection system, consisting of 15 television cameras, monitors, and associated circuitry, that utilizes a commutator and decommutator, allowing time-multiplexed video transmission. When motion is detected by a camera the system alarm sounds at security headquarters and an appropriate warning indicator lights.

### How it's done:

The television cameras are located in remote or unoccupied areas. Video signal frames from 15 television cameras are sequentially combined within the commutator and transmitted along one cable pair to the decommutator. The decommutator reconverts the composite signal to the original video signal frames and channels them in proper sequence to 15 television monitors. The composite signal to the decommutator is also fed from the decommutator receiver to the detection alarm rack. The detection alarm system and the television monitors are housed in an equipment rack at security headquarters.

The detection alarm system inverts the first 15 frames (1 from each camera) of the composite signal and records them on a video magnetic tape loop. The

(continued overleaf)

inverted frames are then played back and compared with the subsequent 15-frame groups received. If there is no motion in the monitored areas, these synchronized positive and negative signals will cancel each other. However, if there is motion, the corresponding frames of the video signals will not match, and the system will generate an output to the proper warning indicator and the system alarm.

The initial record phase requires only 1/2 second. One complete scan of 15 frames of channels (1/30 second per frame) is fed through an isolation amplifier to an inverting amplifier and recorded on a video magnetic tape loop. A flip-flop circuit, controlled by a gate signal from a tape control switch, allows only 1 complete scan of the 15 channels to be inverted and recorded. The second gate signal of the decommutator resets the flip-flop, which, in turn, disables the recording circuit.

During the operating phase of the detection alarm system, a video tape recorder plays back the inverted 15 frames of video through an adjustable delay line (to insure proper synchronization) to an adder circuit. The adder circuit receives both a positive-going waveform (the composite video signal from the isolation amplifier) and a negative-going waveform (the recorded video signal from the tape loop). The signals are algebraically added in the adder circuit and an output voltage is produced only if there is a difference. A difference will occur if any motion is detected. Regardless of the adder output polarity, one of two Schmitt-trigger circuits will be triggered at a preset detecting level. The Schmitt-trigger pulses are gated

and a simultaneous trigger pulse from the Schmitt trigger circuit produces an output from a one-shot multivibrator circuit. The output of the one-shot multivibrator is amplified, energizing a monitor indicator light, the equipment-rack indicator light and the system alarm.

If any motion is detected by a television camera, one of the Schmitt trigger circuits will produce an output simultaneously with a gate signal and the appropriate monitor indicator lamp will light. A reset button, located on the equipment rack, will restore any trigger circuit to an operational state when desired.

**Notes:**

1. This security system could be used in industrial and retail establishments; banks, large retail stores, warehouses, and factories are a few examples.
2. Inquiries concerning this invention may be directed to:

Technology Utilization Officer  
Kennedy Space Center  
Kennedy Space Center, Florida 32899  
Reference: B66-10548

**Patent status:**

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D. C. 20546.

Source: R. C. Fusco  
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